

FIG. 1

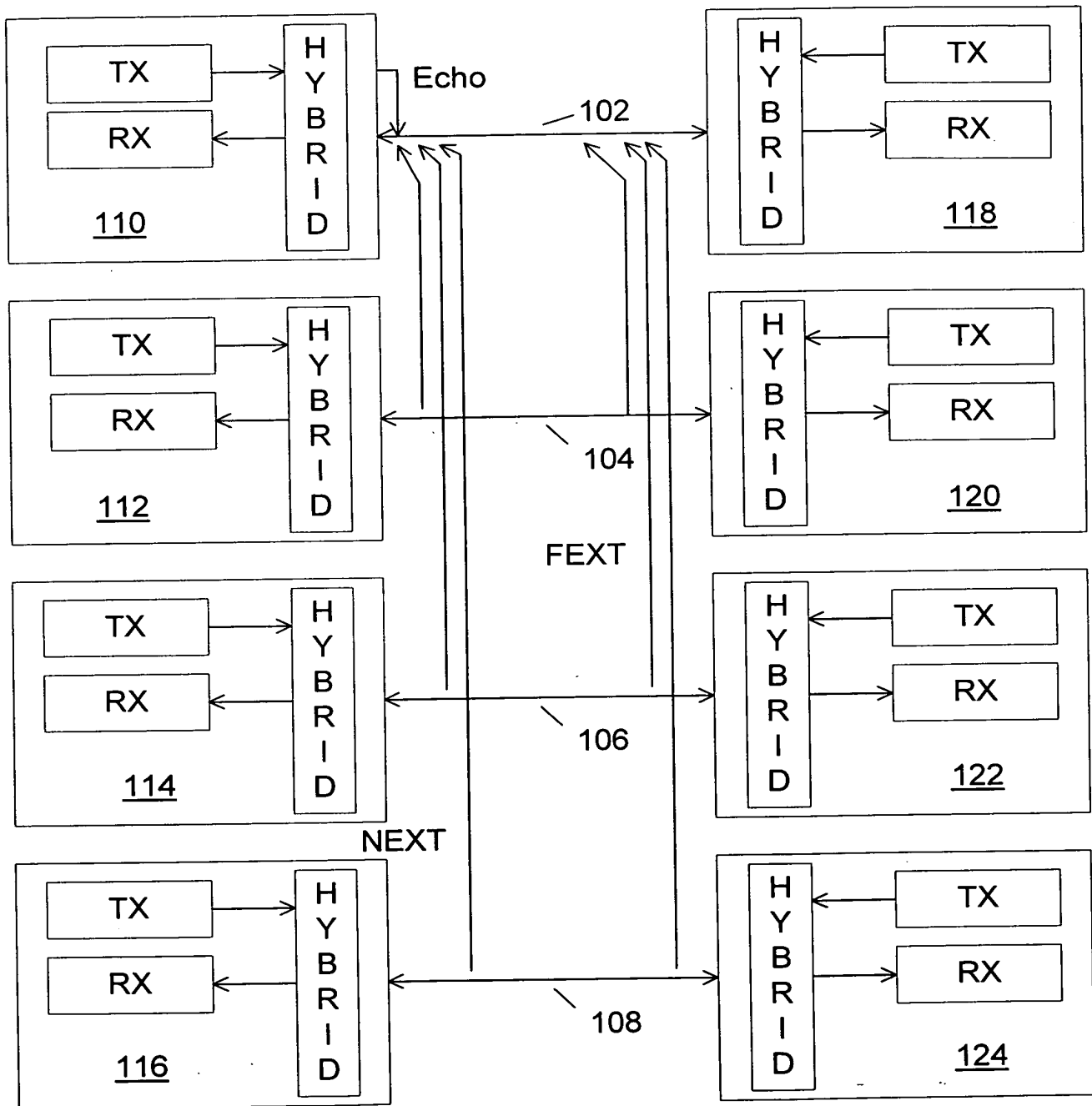


FIG. 1a

The diagram illustrates a feed-forward equalizer system. An input signal X_n enters a block labeled "Channel" (202). The output of the channel is fed into a summing junction (represented by a circle with a cross). This summing junction also receives inputs from an "Echo Canceled" block (204) and a "NEXT Canceled" block (206). The output of this first summing junction is Y_n , which enters a "Feed-Forward Equalizer" block (208). The output of the feed-forward equalizer is Z_n , which is fed into a second summing junction. This second summing junction also receives input from a "Decision-Feedback Equalizer" block (210). The output of the second summing junction is fed into a "Decision Device" (22). The output of the decision device is fed back into the "Decision-Feedback Equalizer" (210) and also branches off to feed into the "Echo Canceled" (204) and "NEXT Canceled" (206) blocks. A dashed line encloses the "Echo Canceled" (204), "NEXT Canceled" (206), "Feed-Forward Equalizer" (208), "Decision-Feedback Equalizer" (210), and "Decision Device" (22) blocks, with a label 200 pointing to the dashed line boundary.

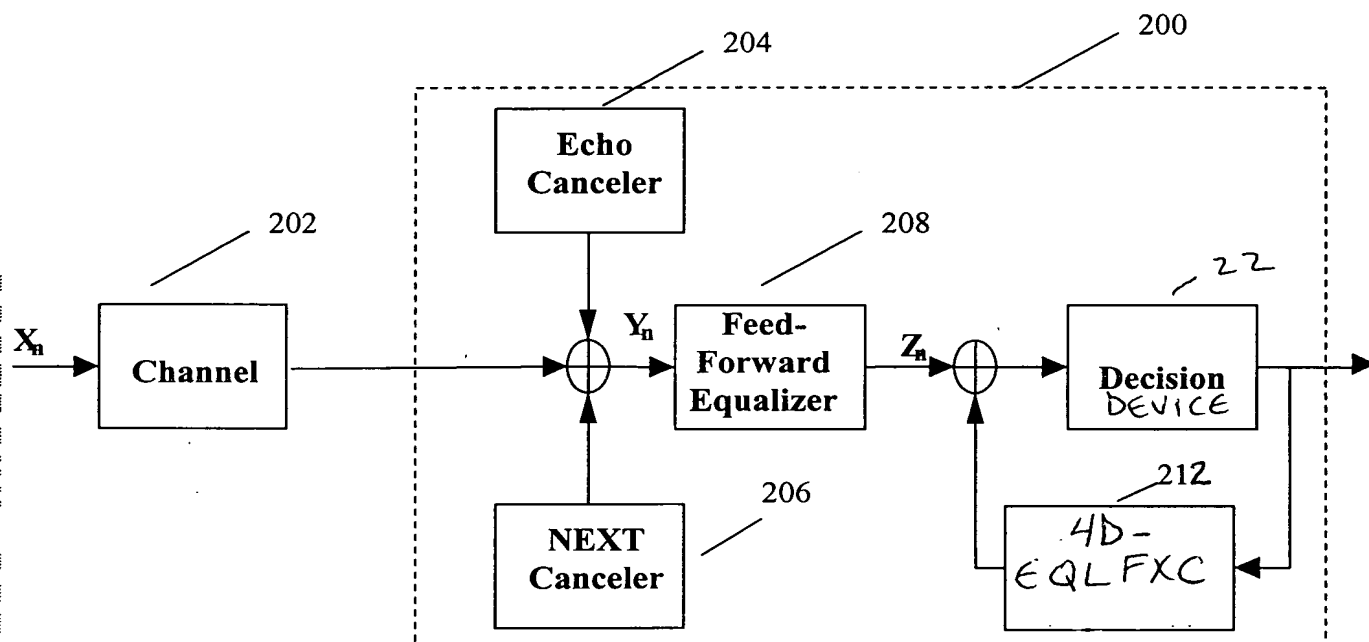
[illegible]

Figure 2a.

The diagram illustrates a feedback system for a tap delay line. It consists of the following components and signal flows:

- Data In**: The input signal entering the system.
- 301 Vector Data Unit Delay**: A unit delay block that receives **Data In** and outputs Y_{n-k} .
- 302 Vector Error * Step**: A block that receives the output of the first delay block and outputs $Z_n - X_n$.
- 303 Matrix Multiplication**: A block that receives $Z_n - X_n$ and Y_{n-k} as inputs.
- 304 Matrix Summation**: A block that receives the output of the first matrix multiplication block and Y_{n-k} as inputs, producing the output Q_{n-k+1} .
- 305 Matrix Tap Unit Delay**: A unit delay block that receives Q_{n-k+1} and outputs Q_{n-k} .
- 306 Matrix Multiplication**: A block that receives Q_{n-k} and Y_{n-k} as inputs, producing the final **Data Out**.

Additional signal paths include a dashed arrow labeled "Vector Data to next Tap" pointing left from the output of block 302, and a feedback loop from the output of block 306 back to the input of block 301.

Figure 3 – A single tap of 4D-EQLFXC

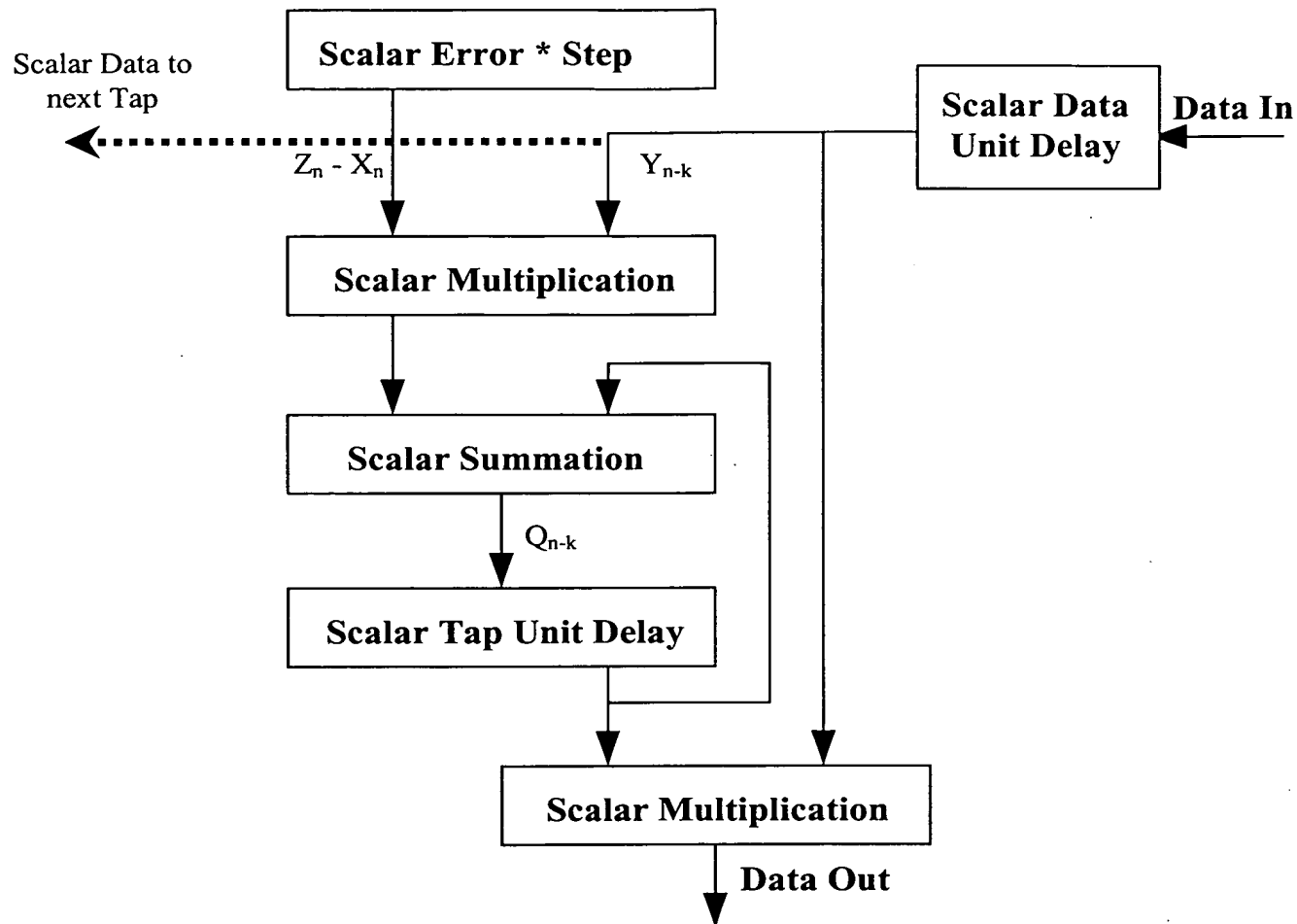


Figure 4 – A single tap of 1D-EQL

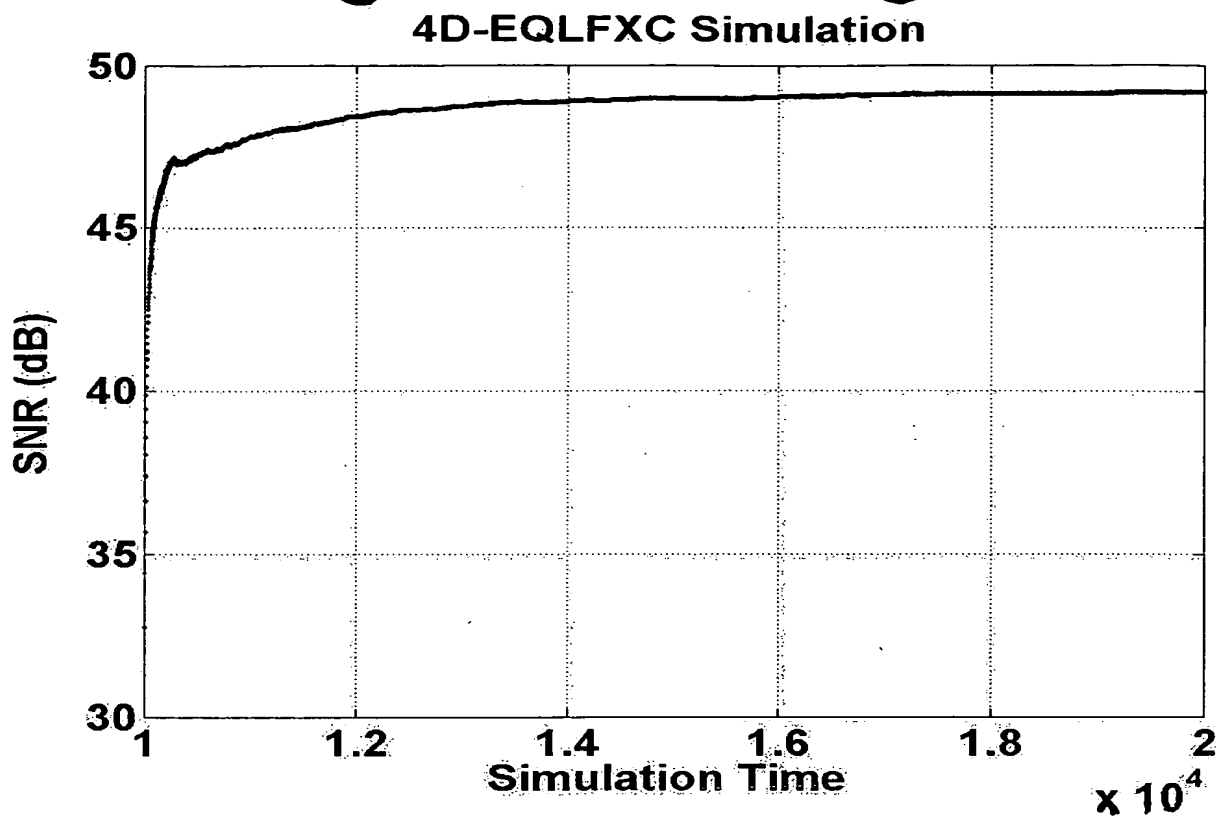


Fig. 5a

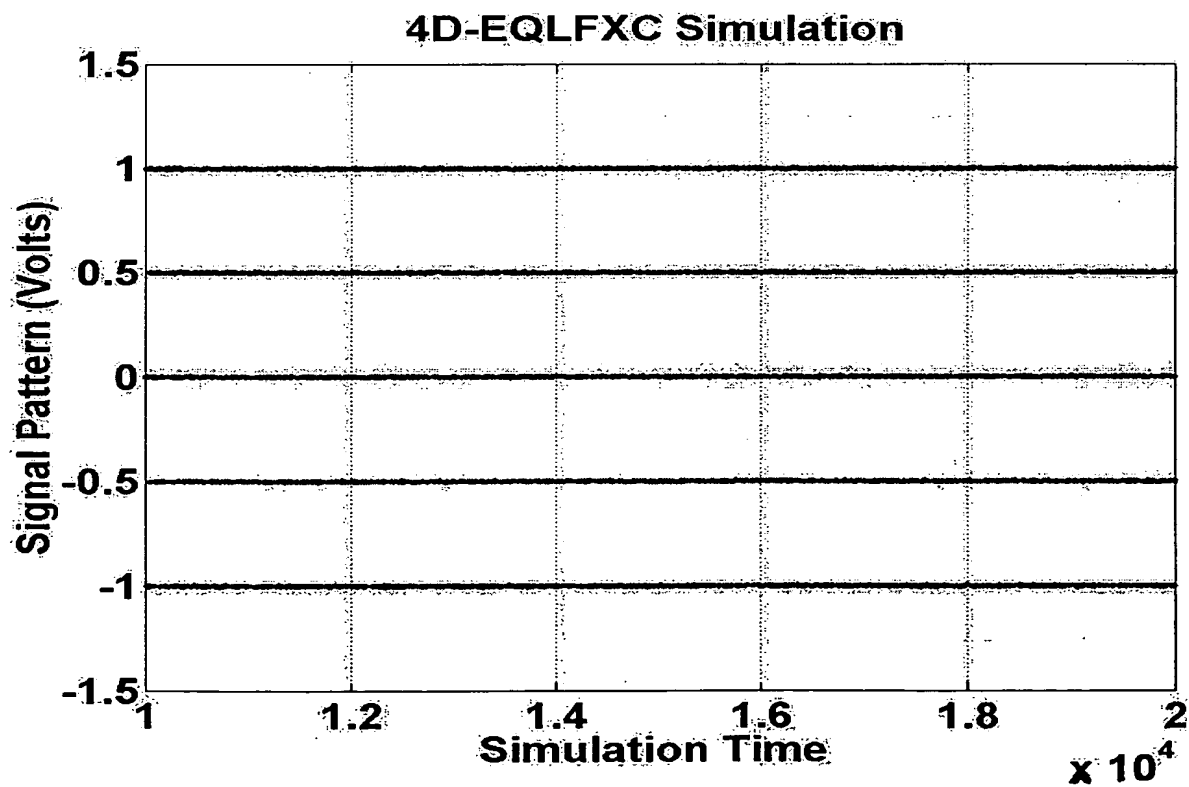


Fig. 5b

4D-EQLFXC simulation
($N=20$, $\mu=0.01$)

4 1D-EQLs Simulation

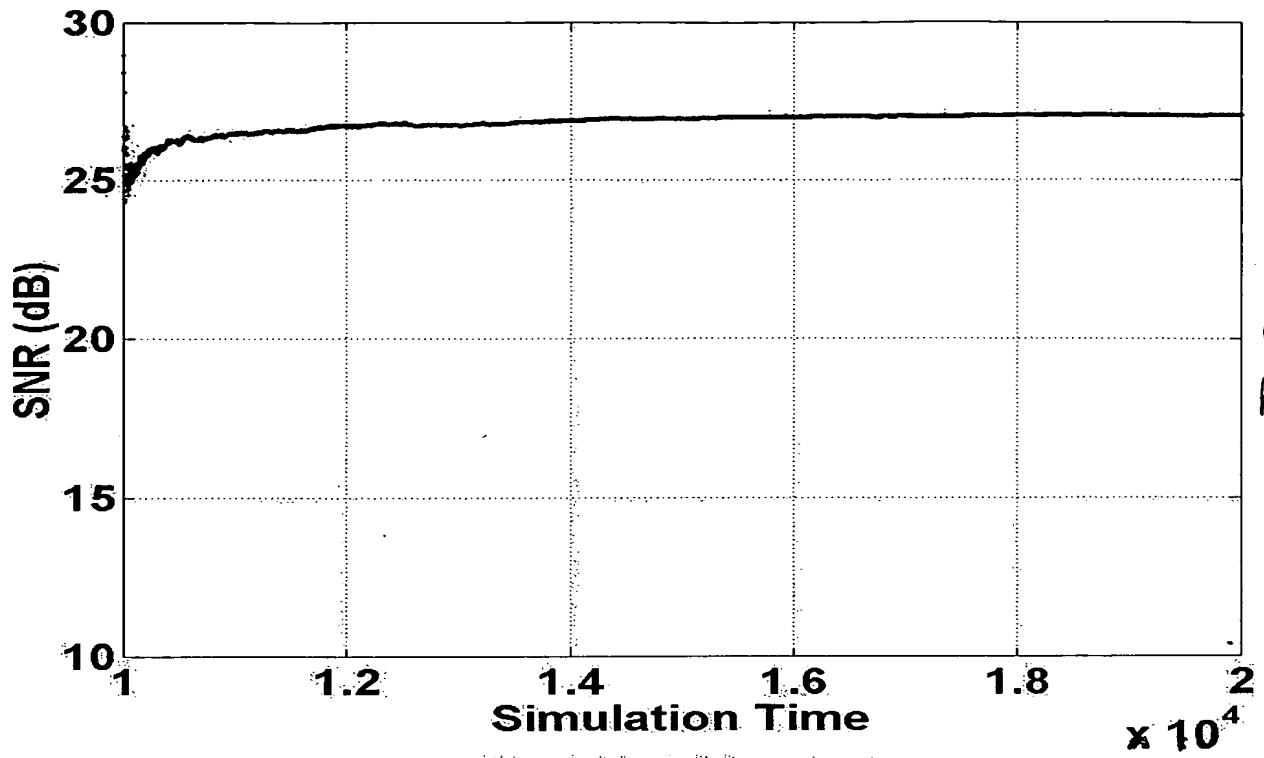


FIG. 6a
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4 1D-EQLs Simulation

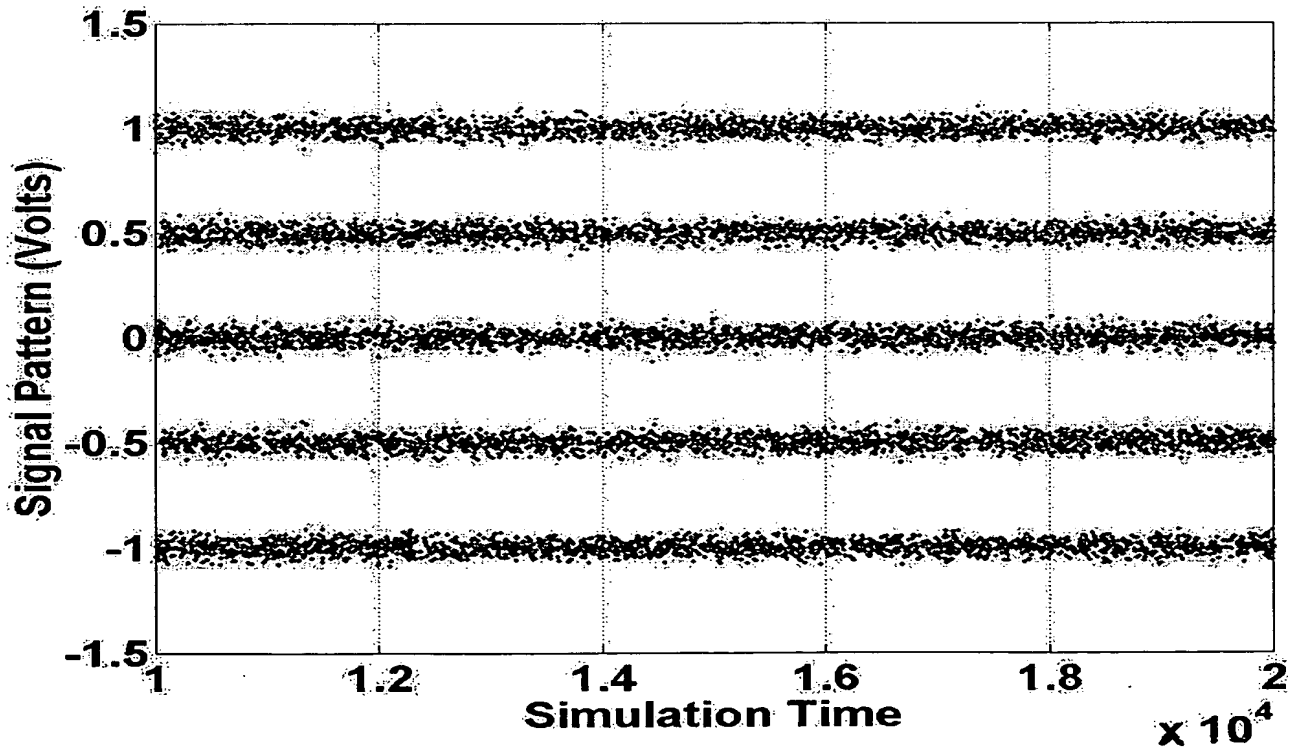


FIG. 6b
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4 1D-EQLs simulation

($N = 50$, $\mu = 0.01$)